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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: Weigler, et al.
US SERIAL NO.: 10/695,187
FILED: October 28, 2003
TITLED: VERTICAL REMOVAL OF EXCESS SOLDER FROM A CIRCUIT SUBSTRATE

GROUP ART UNIT: 1725
DOCKET NO.: IS01207AP

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Filing Date	October 28, 2003
First Named Inventor	Weigler, et al.
Group Art Unit	1725
Examiner Name	Jonathan J. Johnson
Total Number of Pages in this Submission	ISO1207AP

ENCLOSURES

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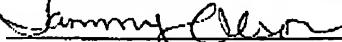
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UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

APPLICANT(S) Weigler, et al. GROUP ART UNIT: 1725
APPLN. NO.: 10/695,187 EXAMINER: Jonathan J. Johnson
FILED: 10/28/2003 Confirmation No. 4286
TITLE: VERTICAL REMOVAL OF EXCESS SOLDER FROM A CIRCUIT
SUBSTRATE

Date of deposit: January 18, 2007, 2007

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APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is Appellants' Appeal Brief in response to the Notification of Non-Compliant Appeal Brief dated December 28, 2006.

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1. REAL PARTY IN INTEREST

This application is subject to an agreement to be assigned to Continental A.G.,
although no such assignment has been recorded to date.

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2. RELATED APPEALS AND INTERFERENCES

Appellants and the undersigned attorneys are not aware of any appeals or any interferences which will directly affect or be directly affected by or having a bearing on the Board's decision in the pending appeal.

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3. STATUS OF CLAIMS

Claims 1-14 stand rejected. Claims 15-20 have been withdrawn.

Claims 1 -7 and 9-13 stand rejected under 35 U.S.C. §103(a) as unpatentable over "Reynolds", United States Patent "3,580,462" ("Reynolds") in view of Carlomango, United States Patent 5,143,272 ("Carlomango").

Claims 8 and 14 stand rejected under 35 U.S.C. §103(a) as unpatentable over "Reynolds" in view of Carlomango in further view of "Matu", JP52-42477.

Claims 1-14 are the claims on appeal. *See, Appendix.*

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4. STATUS OF AMENDMENTS

All amendments to the claims have been entered. No specification amendments have been made.

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5. SUMMARY OF CLAIMED SUBJECT MATTER

In this summary of claimed subject matter, all citations are to the specification of United States Patent Application 10/695,187 filed on October 28, 2003. Further, all citations are illustrative only and support for the cited element may be found elsewhere in the specification.

Independent claim 1:

A method for vertical removal of excess solder 14 (p. 5, line 11) from a circuit substrate 12 (p. 5, line 11) includes providing 60 a sacrificial circuit substrate 30 with a plurality of pads 18, a portion of each pad 38 having a solder-wettable material 34 disposed thereon and wherein the plurality of pads 38 are connected to vias 32 comprising through-holes that are plated with a solder-wettable material (p. 9, lines 5-13). The method further includes placing 64 the plurality of pads 38 of the sacrificial circuit substrate 30 in vertical proximity to the excess solder 14 of the circuit substrate 12 (p. 9, lines 16-17) and heating 66 the excess solder 14 to a liquidous state (p. 9, lines 18-22). In addition, the method includes wicking 68 the excess solder 14 vertically onto the pads of the sacrificial circuit substrate 30 by capillary action (p. 9 line 23 to page 10, line 2) and lifting 70 the sacrificial circuit substrate 30 from the proximity of the circuit substrate 12 while the solder is in a liquidous state (p. 10, lines 3-10).

Dependent claim 2:

One embodiment of the invention includes the elements of independent claim 1 with the additional limitation that the circuit substrate is flexible and the providing step includes providing a rigid sacrificial circuit substrate 30. See, p. 6, lines 11-21.

Independent claim 9:

A method for vertical removal of excess solder 14 (p. 5, line 11) from a ball-grid (p. 5, line 11) array portion of a circuit substrate 12 (p. 5, line 11) having a solder mask 20 (p. 5, lines 14-22) disposed thereon includes providing 60 a rigid sacrificial circuit substrate 30 with a plurality of vias 32 arranged in an array pattern matching that of the ball-grid array portion of the circuit substrate 12, the vias 32 having solder-wettable

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through-holes and placing 64 the plurality of vias 32 of the sacrificial circuit substrate 30 in vertical proximity to the excess solder 14 of the ball-grid array portion of the circuit substrate (p. 9, lines 5-13). Furthermore, the method includes heating 66 the excess solder 14 to a liquidous state (p. 9, lines 18-22), wicking 68 the excess solder 14 vertically into the vias 32 of the sacrificial circuit substrate 30 by capillary action (p. 9 line 23 to page 10, line 2), and lifting 70 the sacrificial circuit substrate 30 from the proximity of the circuit substrate 12 while the solder is in a liquidous state to prevent lateral movement across the solder mask. See, p. 8, lines 17-25 and p. 10, lines 3-10.

See, e.g. pages 6-9 and FIGS 3 and 6, *inter alia*.

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6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1 –7 and 9-13 stand rejected under 35 U.S.C. §103(a) as unpatentable over “Reynolds”, United States Patent “3,580,462” (“Reynolds”) in view of Carlomango, United States Patent 5,143,272 (“Carlomango”).

Claims 8 and 14 stand rejected under 35 U.S.C. §103(a) as unpatentable over “Reynolds” in view of Carlomango in further view of “Matu”, JP52-42477.

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7. ARGUMENTS

A. The Claims 1 -7 and 9-13 stand rejected under 35 U.S.C. §103(a) as unpatentable over "Reynolds", United States Patent "3,580,462" ("Reynolds") in view of Carlonango, United States Patent 5,143,272 ("Carlonango").

The §103(a) rejection of claims 1-7 and 9-13 is traversed.

As an initial matter, the Examiner repeatedly, and mistakenly, refers to United States Patnt 3,580,462 as "Reynolds" although the '462 patent is actually listed as to Vanyi. Appellants will treat the Examiner's rejections substantively, but wish to clarify the record. First, Appellants will illustrate the error of the Examiner's rejections over "Reynolds" in view of Carlonango, and second, the error of the Examiner's rejections over United States Patnt 3,751,799 to Reynolds ("799").

Substantively, to establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art." *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). Because "Reynolds" in view of Carlonango neither teaches nor suggests "a sacrificial circuit substrate" and a "circuit substrate", this obviousness rejection must fail.

"Reynolds" teaches a soldering apparatus including an elongated heated applicator with a solder reservoir area. The elongated heated applicator includes a plurality of apertures leading to the reservoir area so that excess solder is wicked from the work surface into the solder reservoir area. See, "Reynolds", abstract, FIG. 1, and column 4, lines 14-69, *inter alia*.

Additionally, Carlonango teaches a desoldering device including a removable heater cartridge and a base unit. The base unit includes an assembly interior with a solder collection chamber and a vacuum source. See, abstract, Carlonango. The device of Carlonango relates to a desoldering tool employing a solder collection tray with a disposable liner and replacable major components. See, Carlonango, col. 1, lines 5-9.

Contrary to the Examiner's assertions, "Reynolds" does not teach use of two circuit boards – a sacrificial circuit substrate and a circuit substrate, as claimed in claims 1

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and 9. In the claimed invention, excess solder is heated, and wicked from the circuit substrate to pads of the sacrificial substrate. The sacrificial substrate is lifted from the proximity of the circuit substrate. Simply put, these steps and structures are not taught or suggested by either "Reynolds" or Carjomango, alone or in combination.

At best, the Examiner seems to indicate that the reservoir area of "Reynolds" is similar to the claimed sacrificial circuit substrate. This allegation is misplaced, as the reservoir area of "Reynolds" is part of the soldering tool, and the Examiner proffers no evidence that one of ordinary skill in the art would consider a sacrificial circuit substrate a soldering tool. Although the Examiner does not rely on Carjomango for such a teaching, Appellants note that no such structure or method is taught by Carjomango, and therefore Carjomango does not cure this defect.

With respect to the '799 reference in view of Carjomango, Appellants note that the references, alone or in combination, fail to teach or suggest that the sacrificial circuit substrate includes a plurality of pads, each pad having a solder-wettable material disposed thereon and each pad connected to vias comprising through-holes that are plated with solder-wettable material, as claimed in claims 1 and 9. As noted above, Carjomango does not teach a sacrificial circuit substrate, and therefore cannot teach a sacrificial circuit substrate with each of the claimed elements. Since the Examiner agrees that '799 does not teach the claimed elements, this rejection must fall, since the references, either alone or in combination, fail to teach or suggest each limitation.

In addition, '799 teaches, at most, a solder terminal rework technique in which excess solder is removed by depositing a layer of solderable material on a member "essentially duplicating the heat transfer characteristics of the chip." See, abstract '799. The Examiner likens layers 22 and 20 to the claimed elements, but clearly these structures cannot be "the sacrificial circuit substrate includes a plurality of pads, each pad having a solder-wettable material disposed thereon and each pad connected to vias comprising through-holes that are plated with solder-wettable material." The Examiner's allegation that "it would have been obvious" to "utilize a vacuum suction point at each solder land" is misplaced. No such teaching is made in either '799, "Reynolds" or Carjomango.

In addition, there can be no motivation to modify either "Reynolds" or '799 as suggested by the Examiner because neither "Reynolds" nor '799 denounces its teachings

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as less than an ideal method of removing excess solder and Carlonango fails to pronounce its desoldering device as an ideal solution.

In addition, the mere fact that "Reynolds" or '799 could be modified to obtain the claimed invention (which Appellants deny) does not render the resultant modification obvious unless the prior art also suggests the desirability of the combination. See, *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990) (Claims were directed to an apparatus for producing an aerated cementitious composition by drawing air into the cementitious composition by driving the output pump at a capacity greater than the feed rate. The prior art reference taught that the feed means can be run at a variable speed, however the court found that this does not require that the output pump be run at the claimed speed so that air is drawn into the mixing chamber and is entrained in the ingredients during operation. Although a prior art device "may be capable of being modified to run the way the apparatus is claimed, there must be a suggestion or motivation in the reference to do so." 916 F.2d at 682, 16 USPQ2d at 1432.). See also *In re Fritch*, 972 F.2d 1260, 23 USPQ2d 1780 (Fed. Cir. 1992) (flexible landscape edging device which is conformable to a ground surface of varying slope not suggested by combination of prior art references).

Furthermore, claim 2 requires that the circuit substrate is flexible and the providing step includes providing a rigid sacrificial circuit substrate 30. See, p. 6, lines 11-21. No such limitation is taught by the references alone or in combination. Indeed, the Examiner does not even allege such a teaching in the rejection.

In addition, claims 2-8 and 10-14 are dependent claims, depending directly from independent claims 1 or 9 which are allowable for at least the reasons described above, and are therefore allowable for at least these reasons.

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B. **Claims 8 and 14 stand rejected under 35 U.S.C. §103(a) as unpatentable over "Reynolds" in view of Carlomango in further view of "Matu", JP52-42477.**

The §103(a) rejection of claims 8 and 14 is traversed.

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art." *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). Claims 8 and 14 depend from claims 1 or 9 respectively and are therefore patentable over the combination of references for at least the same reasons as independent claims 1 and 9.

Therefore, Appellants request the withdrawal of the rejections to claims 1-14.

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SUMMARY

The Appellants respectfully submit that claims 1-14 fully satisfy the requirements of 35 U.S.C. §§102, 103 and 112. In view of the foregoing, favorable consideration and early passage to issue of the present application is respectfully requested.

Date: January 18, 2007, 2007

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Respectfully submitted,
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10. APPENDIX

1. A method for vertical removal of excess solder from a circuit substrate, the method comprising the steps of:

providing a sacrificial circuit substrate with a plurality of pads, a portion of each pad having a solder-wettable material disposed thereon and wherein the plurality of pads are connected to vias comprising through-holes that are plated with a solder-wettable material;

placing the plurality of pads of the sacrificial circuit substrate in vertical proximity to the excess solder of the circuit substrate;

heating the excess solder to a liquidous state;

wicking the excess solder vertically onto the pads of the sacrificial circuit substrate by capillary action; and

lifting the sacrificial circuit substrate from the proximity of the circuit substrate while the solder is in a liquidous state.

2. The method of claim 1, wherein the circuit substrate is flexible and wherein the providing step includes providing a rigid sacrificial circuit substrate.

3. The method of claim 1, wherein the heating step includes using hot gas to reflow the excess solder.

4. The method of claim 1, wherein the providing step includes providing solder-wettable vias connected to the pads, the vias including through-holes that are plated with a solder-wettable material.

5. The method of claim 1, wherein the wicking step includes wicking of the solder into the through-holes of the vias.

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6. The method of claim 1, wherein the dimensions of the pads, vias and through-holes are configured to leave a residual amount of solder on the circuit substrate after the wicking and lifting steps.

7. The method of claim 1, wherein the wicking step further comprises applying a vacuum to the vias to assist wicking of the solder into the vias.

8. The method of claim 1, further comprising the step of applying flux to the sacrificial circuit substrate.

9. A method for vertical removal of excess solder from a ball-grid array portion of a circuit substrate having a solder mask disposed thereon, the method comprising the steps of:

providing a rigid sacrificial circuit substrate with a plurality of vias arranged in an array pattern matching that of the ball-grid array portion of the circuit substrate, the vias having solder-wettable through-holes;

placing the plurality of vias of the sacrificial circuit substrate in vertical proximity to the excess solder of the ball-grid array portion of the circuit substrate;

heating the excess solder to a liquidous state;

wicking the excess solder vertically into the vias of the sacrificial circuit substrate by capillary action; and

lifting the sacrificial circuit substrate from the proximity of the circuit substrate while the solder is in a liquidous state to prevent lateral movement across the solder mask.

10. The method of claim 9, wherein the heating step includes using hot gas to reflow the excess solder.

11. The method of claim 9, wherein the providing step includes providing the vias with solder-wettable pads connected to the solder-wettable material of the through-holes.

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12. The method of claim 9, wherein the wicking step includes applying a vacuum to the vias to assist wicking of the solder into the vias and leaving a residual solder amount on the ball-grid array portion of the circuit substrate sufficient to solder a ball-grid array package thereon.
13. The method of claim 12, wherein the providing step includes providing the vias with solder-wettable pads connected to the through-holes, and wherein the pads and the through-holes are configured to leave a predetermined amount of solder on the circuit substrate after the wicking and lifting steps.
14. The method of claim 9, further comprising the step of applying flux to the sacrificial circuit substrate.

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Evidence Appendix

None

Related Proceedings Appendix

None.